SEQUENCE LISTING

<110> Cahoon, Rebecca E.
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<120> PHYTIC ACID BIOSYNTHETIC ENZYMES

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<151> APRIL 24, 1998

<150> PCT/US99/08790
<151> APRIL 22, 1999

<160> 24

<170> Microsoft Office 97

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<213> Oryza sativa

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acgacccgac ctggatcgtc gacccctcg atggcaccac caatttcgtc catggcttcc 420
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<213> Oryza sativa

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Ala Gly Glu Ile Ile Arg Lys Gly Phe Tyr Gln Thr Lys Asn Val Glu
20 25 30

His Lys Gly Gln Val Asp Leu Val Thr Glu Thr Asp Lys Ala Cys Glu
35 40 45

Asp Leu Ile Phe Asn His Leu Arg Lys His Tyr Pro Asp His Lys Phe
50 55 60

Ile Gly Glu Glu Thr Ser Ala Gly Leu Gly Ala Thr Ala Asp Leu Thr
65 70 75 80

Asp Asp Pro Thr Trp Ile Val Asp Pro Leu Asp Gly Thr Thr Asn Phe
85 90 95

Val His Gly Phe Pro Phe Val Cys Val Ser Ile Gly Leu Thr Val Gly
100 105 110

Lys Ile
114

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<213> Glycine max

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tcctcgcatc tgcggtcgac gcggctcaga aagctggcga gattattcga aaaggcttct 180
accagaccaa aaatgtggaa cacaaaggac aggttgattt ggtcacagaa actgataaag 240
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Lys Asn Val Glu His Lys Gly Gln Val Asp Leu Val Thr Glu Thr Asp
35 40 45

Lys Ala Cys Glu Glu Leu Ile Phe Asn His Leu Lys Gln Leu Tyr Pro
50 55 60

Thr His Lys Phe Ile Gly Glu Glu Thr Thr Ala Ala Tyr Gly Thr Thr
65 70 75 80

Glu Leu Thr Asp Glu Pro Thr Trp Ile Val Asp Pro Leu Asp Gly Thr
85 90 95

Thr Asn Phe Val His Gly Phe Pro Phe Val Cys Val Ser Ile Gly Leu
100 105 110

Thr Ile Gly Lys Thr Pro Thr Ile Gly Val Val Tyr Asn Pro Ile Ile
115 120 125

Asn Glu Leu Phe Thr Gly Ile His Gly Lys Gly Ala Phe Leu Asn Gly
130 135 140

Asn Pro Ile Lys Val Ser Ser Gln Thr Glu Leu Ile Ser Ser Leu Leu
145 150 155 160

Ala Thr Glu Ala Gly Thr Lys Arg
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<210> 5
<211> 667
<212> DNA
<213> Glycine max

<400> 5
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cagattttgc aataacatct cagcgagtag cagtttcaaa ccctttctaa aaggatgaac 180
ttgtggaaac tcggcgcaaa atggggtggg aaatttacaa ttaaccattg gcaagacctt 240
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ggggccg 667

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<211> 73
<212> PRT
<213> Glycine max

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Val Val Phe Asp Pro Ser Gly Ala Asp Phe Ala Ile Thr Ser Gln Arg
35 40 45

Val Ala Val Ser Asn Pro Phe Xaa Lys Asp Glu Leu Val Glu Thr Arg
50 55 60

Arg Lys Met Gly Trp Glu Ile Tyr Asn
65 70

<210> 7
<211> 1003
<212> DNA
<213> Triticum aestivum

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gaaaaggtgc ttttctcaat ggctctccaa ttaaaacatc gcctcaaaat gagttggtga 480
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gtggcccctg ggatgtggct gctggagctt tgattctaaa ggaagctggg ggttttgttt 720
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<210> 8
<211> 267
<212> PRT
<213> Triticum aestivum

<400> 8
Met Ala Glu Glu Gln Phe Leu Ala Ala Ala Val Gly Ala Ala Lys Ser
1 5 10 15

Ala Gly Glu Ile Ile Arg Lys Ser Phe Tyr Leu Ser Lys Lys Val Glu
20 25 30

His Lys Gly Gln Val Asp Leu Val Thr Glu Thr Asp Lys Ala Cys Glu
35 40 45

Asp Leu Ile Phe Asn His Leu Arg Met Leu Tyr Pro Asp His Lys Phe
50 55 60

Ile Gly Glu Glu Thr Ser Ala Ala Leu Gly Ser Thr Asp Asp Leu Thr
65 70 75 80

Tyr Asp Pro Thr Trp Ile Val Asp Pro Leu Asp Gly Thr Thr Asn Phe
85 90 95

Val His Gly Phe Pro Phe Val Cys Val Ser Ile Gly Leu Thr Ile Gly
100 105 110

Lys Ile Pro Thr Val Gly Val Val Tyr Asn Pro Ile Met Asn Glu Leu
115 120 125

Phe Thr Ala Val Arg Gly Lys Gly Ala Phe Leu Asn Gly Ser Pro Ile
130 135 140

Lys Thr Ser Pro Gln Asn Glu Leu Val Lys Ala Leu Met Val Thr Glu
145 150 155 160

Val Gly Thr Lys Arg Asp Lys Ser Thr Leu Asp Asp Thr Thr Asn Arg
165 170 175

Ile Asn Lys Leu Leu Phe Lys Ile Arg Ser Ile Arg Met Cys Gly Ser
180 185 190

Leu Ala Leu Asn Met Cys Gly Val Ala Cys Gly Arg Leu Asp Leu Cys
195 200 205

Tyr Glu Ile Gly Phe Gly Gly Pro Trp Asp Val Ala Ala Gly Ala Leu
210 215 220

Ile Leu Lys Glu Ala Gly Gly Phe Val Phe Asp Pro Ser Gly Asp Glu
225 230 235 240

Phe Asp Leu Met Ala Gln Arg Met Ala Gly Ser Asn Gly His Leu Lys
245 250 255

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Asp Gln Phe Ile Lys Ala Leu Gly Asp Ala Ser
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<210> 9
<211> 1090
<212> DNA
<213> Hordeum vulgare

<400> 9

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gtgcattgat cctttagatg gaacaacaaa ctttgcacat ggttacccca gcttttctgt  180
atccattggt gttctttatc gaggcaagcc tgctgctgcc actgtggtgg aattttgtgg  240
tgggcctatg tgctggagca ctcgtacaat ttctgcatct tctggcaaag gtgcttattg  300
taatgggcaa aaaattcatg tcagtccaac agaaaaggtg gaacagtctc ttctggtaac  360
tgggtttgga tatgaacatg atgatgcatg gctcaccaat ataaatttgt tcaaggaatt  420
tactgatgtt agcaggggag tacgaaggct aggctctgct gctgccgata tgtcccatgt  480
tggtctaggc attacagaag cctactggga atatcggctt aagccgtggg acatggctgc  540
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tacagtcttt gatcgttctg ttcttgtttc caatggcgtt gttcatgatc agcttttgga  660
gcggatccgg cctgctactg aagatcttaa gaagaaagga attgatttct ccttgtggtt  720
taagcctgac aagtacccta ccgacttctg aatcacgctg ctcttcagct acttgttctc  780
tgtctagcaa aaataaggat gtttttgctg aacaaccatg tacttagact gacaatacat  840
ttcaagaccc tttcactcaa ccggatcgaa aattaaagcc gaactttaca taaaggagta  900
gagctcgaat gagcttctca ctggattcct tttgctttga tcgaatgtat caggaagaaa  960
tgtttgcaaa aggtgttgta tgcatggttc agcctgttg tacttggaaa aatataactg 1020
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aaaaaaaaaa                                                       1090
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<210> 10
<211> 249
<212> PRT
<213> Hordeum vulgare

<400> 10

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His Glu Asp Lys Leu Ser Glu Ser Val Ile Leu Glu Val Val Thr Lys
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Asn Phe Arg Asp His Leu Ile Leu Gly Glu Glu Gly Gly Leu Ile Gly
             20                  25                  30

Asp Ser Leu Ser Glu Tyr Leu Trp Cys Ile Asp Pro Leu Asp Gly Thr
         35                  40                  45

Thr Asn Phe Ala His Gly Tyr Pro Ser Phe Ser Val Ser Ile Gly Val
     50                  55                  60

Leu Tyr Arg Gly Lys Pro Ala Ala Ala Thr Val Val Glu Phe Cys Gly
 65                  70                  75                  80

Gly Pro Met Cys Trp Ser Thr Arg Thr Ile Ser Ala Ser Ser Gly Lys
                 85                  90                  95

Gly Ala Tyr Cys Asn Gly Gln Lys Ile His Val Ser Pro Thr Glu Lys
            100                 105                 110

Val Glu Gln Ser Leu Leu Val Thr Gly Phe Gly Tyr Glu His Asp Asp
        115                 120                 125

Ala Trp Leu Thr Asn Ile Asn Leu Phe Lys Glu Phe Thr Asp Val Ser
    130                 135                 140

Arg Gly Val Arg Arg Leu Gly Ser Ala Ala Ala Asp Met Ser His Val
145                 150                 155                 160
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```
Gly Leu Gly Ile Thr Glu Ala Tyr Trp Glu Tyr Arg Leu Lys Pro Trp
                165                 170                 175

Asp Met Ala Ala Gly Val Leu Ile Val Glu Glu Ala Gly Gly Val Val
            180                 185                 190

Thr Arg Met Asp Gly Gly Glu Phe Thr Val Phe Asp Arg Ser Val Leu
        195                 200                 205

Val Ser Asn Gly Val Val His Asp Gln Leu Leu Glu Arg Ile Arg Pro
    210                 215                 220

Ala Thr Glu Asp Leu Lys Lys Lys Gly Ile Asp Phe Ser Leu Trp Phe
225                 230                 235                 240

Lys Pro Asp Lys Tyr Pro Thr Asp Phe
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<211> 989
<212> DNA
<213> Zea mays

<400> 11
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ctccaccgtc catgcgagtt accaccccac cagcttcctc tactatcagg acgccagcat 480
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ccttgaacag attcatattg gtcgtccagg catcatcgtg ttcatatcca aaacctgtga 660
cgagaagtga ttgttccacc ttgtctgtct gactgacatg aatcctttgt ccaatataat 720
aagctcctcc gccagcaaat ggaaaaattg ttcgggtggt ccaacacata aggccgccac 780
aaaattctca cccacttgaa accacacggg ttttcccagg aaagaacaac taatggcaca 840
ggtaaacccg ggggtaccat tggcaaagtt ccttgtctcc accaaagggt aattgcccca 900
aaggtctcct gaaagggaat ctccaaaaag ggcgcctttt ccccccaatt aaaggggggc 960
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<210> 12
<211> 136
<212> PRT
<213> Zea mays

<400> 12
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Met Cys Trp Thr Thr Arg Thr Ile Phe Pro Phe Ala Gly Gly Gly Ala
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Tyr Tyr Ile Gly Gln Arg Ile His Val Ser Gln Thr Asp Lys Val Glu
            20                  25                  30

Gln Ser Leu Leu Val Thr Gly Phe Gly Tyr Glu His Asp Asp Ala Trp
        35                  40                  45

Thr Thr Asn Met Asn Leu Phe Lys Glu Phe Thr Asp Ile Ser Arg Gly
    50                  55                  60

Val Arg Arg Leu Gly Ser Ala Ala Ala Asp Met Ser His Ile Gly Leu
65                  70                  75                  80

Gly Ile Thr Glu Ala Tyr Trp Glu Tyr Arg Leu Lys Pro Trp Asp Val
                85                  90                  95
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His Ala Gly Val Leu Ile Val Glu Glu Ala Gly Gly Val Val Thr Arg
            100                 105                 110

Met Asp Gly Gly Glu Phe Thr Val Phe Asp Arg Ser Val Leu Val Ser
        115                 120                 125

Asn Gly Leu Val His Gly Gln Val
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<210> 13
<211> 492
<212> DNA
<213> Zea mays

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<400> 13

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cctcgcctcc gcaaacccta acccccgctc tcgcctcctc cgcctccgcg ccgcctcgcc 180
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<210> 14
<211> 338
<212> PRT
<213> Zea mays

<400> 14

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Gly Leu Ala Ser Ala Asn Pro Asn Pro Arg Ser Arg Leu Leu Arg Leu
             20                  25                  30

Arg Ala Ala Ser Pro Val Ser Ser Ala Val Leu Ser Ala Ser Gly Arg
         35                  40                  45

Gln Pro Met Ser Thr Val Arg Ala Ser Phe Ala Ala Gly Ala Ala Gly
     50                  55                  60

Arg Arg Ala Ala Ala Val Gly Glu Leu Ala Thr Glu Arg Leu Val Glu
 65                  70                  75                  80

Val Ala Gln Arg Ala Ala Asp Ala Ala Gly Glu Val Leu Arg Lys Tyr
                 85                  90                  95

Phe Arg Gln Arg Val Glu Ile Ile Asp Lys Glu Asp His Ser Pro Val
            100                 105                 110

Thr Ile Ala Asp Arg Glu Ala Glu Glu Ala Met Val Ser Val Ile Leu
        115                 120                 125
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Lys Ser Phe Pro Thr His Ala Ile Phe Gly Glu Glu Asn Gly Trp Arg
    130                 135                 140

Cys Ala Glu Asn Ser Ala Asp Phe Val Trp Val Leu Asp Pro Ile Asp
145                 150                 155                 160

Gly Thr Lys Ser Phe Ile Thr Gly Lys Pro Leu Phe Gly Thr Leu Ile
                165                 170                 175

Ala Leu Leu His Asn Gly Lys Pro Val Ile Gly Val Ile Asp Gln Pro
            180                 185                 190

Ile Leu Arg Glu Arg Trp Ile Gly Val Asp Gly Lys Gln Thr Thr Leu
        195                 200                 205

Asn Gly Gln Glu Ile Ser Val Arg Ser Cys Asn Leu Leu Ala Gln Ala
    210                 215                 220

Tyr Leu Tyr Thr Thr Ser Pro His Leu Phe Glu Ala Asp Ala Glu Asp
225                 230                 235                 240

Ala Phe Ile Arg Val Arg Asn Lys Val Lys Val Pro Leu Tyr Gly Cys
                245                 250                 255

Asp Cys Tyr Ala Tyr Ala Leu Leu Ala Ser Gly Phe Val Asp Ile Val
            260                 265                 270

Val Glu Ser Gly Leu Lys Pro Tyr Asp Phe Leu Ser Leu Val Pro Val
        275                 280                 285

Ile Glu Gly Ala Gly Gly Ser Ile Thr Asp Trp Arg Gly Asp Lys Leu
    290                 295                 300

His Trp Pro Val Thr Ala Glu Ser Arg Pro Thr Ser Phe Asn Val Val
305                 310                 315                 320

Ala Ala Gly Asp Ala Arg Val His Lys Glu Ala Leu Asp Ala Leu Arg
                325                 330                 335

Trp Arg
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<210> 15
<211> 593
<212> DNA
<213> Oryza sativa

<400> 15
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acgaagacta ggttctgctg ctgctgacat gtcccacgtt gccctaggca ttacagaagc 180
ctactgggaa taccgactta agccttggga tatggctgct ggtgttctga tagttgaaga 240
agctggtggg atggtgtcac gcatggatgg tggggagttt accgtctttg atcgttctgt 300
ccttgtttcc aatggtgttg tacatgatca gcttttggat cggattggcc ctgccacaga 360
agatcttaag aagaaaggaa ttgatttctc cttgtggttt aaacccgaca aataccctac 420
cgacttttaa gttgaactcc tcacccagag ctattttata ctactagaag aaaagagaaa 480
aacagaggat cttatgttaa aatgccatgt acttgactga atatttgttt attgaagtcc 540
tttgactcaa aaaaaaaaaa aaaaaaaaac tcgaggggg gccggtacac aat 593

<210> 16
<211> 142
<212> PRT
<213> Oryza sativa

<400> 16
His Glu Leu Thr Lys Val Glu Gln Ser Leu Leu Val Thr Gly Phe Gly
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Tyr Glu His Asp Asp Ala Trp Val Thr Asn Ile Asn Leu Phe Lys Glu
20 25 30

Tyr Thr Asp Ile Ser Arg Gly Val Arg Arg Leu Gly Ser Ala Ala Ala
35 40 45

Asp Met Ser His Val Ala Leu Gly Ile Thr Glu Ala Tyr Trp Glu Tyr
50 55 60

Arg Leu Lys Pro Trp Asp Met Ala Ala Gly Val Leu Ile Val Glu Glu
65 70 75 80

Ala Gly Gly Met Val Ser Arg Met Asp Gly Gly Glu Phe Thr Val Phe
85 90 95

Asp Arg Ser Val Leu Val Ser Asn Gly Val Val His Asp Gln Leu Leu
100 105 110

Asp Arg Ile Gly Pro Ala Thr Glu Asp Leu Lys Lys Lys Gly Ile Asp
115 120 125

Phe Ser Leu Trp Phe Lys Pro Asp Lys Tyr Pro Thr Asp Phe
130 135 140

<210> 17
<211> 1103
<212> DNA
<213> Glycine max

<400> 17
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tcggtaacaa agtcgccgat gctgccggag aagttatccg caaatacttc agaaaaaact 180
tcgacgttat tcacaaacat gatctcagtc cagtaaccat tgcagatcaa tctgctgagg 240
aggctatggt ttcaatcata ctagacaatt tcccttctca tgccatttac ggagaggaaa 300
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gccgtacaaa tctccccgcc ccg 1103

<210> 18
<211> 295
<212> PRT
<213> Glycine max

<400> 18
Met Phe Ser Gln Cys His Phe Leu Ser His Ser Pro Ile Pro Asn Thr
1 5 10 15

Thr Phe Arg Leu Arg Ala Met Ala Pro His Ser Thr Pro Leu Glu Leu
20 25 30

Asn Arg Phe Ala Glu Val Gly Asn Lys Val Ala Asp Ala Ala Gly Glu
35 40 45

Val Ile Arg Lys Tyr Phe Arg Lys Asn Phe Asp Val Ile His Lys His
50 55 60

Asp Leu Ser Pro Val Thr Ile Ala Asp Gln Ser Ala Glu Glu Ala Met
65 70 75 80

Val Ser Ile Ile Leu Asp Asn Phe Pro Ser His Ala Ile Tyr Gly Glu
85 90 95

Glu Asn Gly Trp Arg Cys Glu Glu Lys Asn Ala Asp Tyr Val Trp Val
100 105 110

Leu Asp Pro Ile Asp Gly Thr Lys Ser Phe Ile Thr Gly Lys Pro Val
115 120 125

Phe Gly Thr Leu Val Ala Leu Leu Gln Asn Gly Thr Pro Ile Leu Gly
130 135 140

Ile Ile Asp Gln Pro Val Leu Arg Glu Arg Trp Ile Gly Ile Ala Gly
145 150 155 160

Lys Arg Thr Ser Leu Asn Gly Gln Glu Ile Ser Thr Arg Thr Cys Ala
165 170 175

Asp Leu Ser Gln Ala Tyr Leu Tyr Thr Thr Ser Pro His Leu Phe Asn
180 185 190

Gly Asp Ala Glu Glu Ala Phe Ile Arg Val Arg Ser Lys Val Lys Phe
195 200 205

Gln Leu Tyr Gly Cys Asp Cys Tyr Ala Tyr Ala Leu Leu Ser Ser Gly
210 215 220

Phe Val Asp Leu Val Val Glu Ser Gly Leu Lys Pro Tyr Asp Phe Leu
225 230 235 240

Ala Leu Ile Pro Val Ile Glu Gly Ala Gly Gly Val Ile Thr Asp Trp
245 250 255

Lys Gly Asp Lys Leu Phe Trp Glu Ala Ser Pro Leu Ser Ile Ala Thr
260 265 270

Ser Phe Asn Val Val Ala Ala Gly Asp Lys Gln Ile His Gln Gln Ala
275 280 285

Leu Asp Ser Leu Gln Trp Lys
290 295

<210> 19
<211> 1418
<212> DNA
<213> Triticum aestivum

<400> 19
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cgctgataga gaagcagaag aagcaatgac ctcagtcata ctgaagagct ttcctactca 360
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<210> 20
<211> 324
<212> PRT
<213> Triticum aestivum

<400> 20
His Glu Thr Lys Pro Ser Leu Pro Tyr His Leu Arg Ser Pro Ser Leu
1 5 10 15

Leu Ala Thr Phe Ser Ser Ser Ala Ala Gly Arg Ala Cys Gly Ile Ala
20 25 30

Gly Arg Trp Met Gly Ser Val Arg Ala Ser Pro Ser Glu Ala Gly Gly
35 40 45

Trp Ala Val Ala Ala Ala Gly Lys Glu Gly Val Asp Met Glu Arg Leu
50 55 60

Val Ala Val Ala Gln Ser Ala Ala Asp Ala Ala Gly Glu Val Leu Arg
65 70 75 80

Lys Tyr Phe Arg Gln Arg Phe Glu Ile Ile Asp Lys Glu Asp His Ser
85 90 95

Pro Val Thr Ile Ala Asp Arg Glu Ala Glu Glu Ala Met Thr Ser Val
100 105 110

Ile Leu Lys Ser Phe Pro Thr His Ala Val Phe Gly Glu Glu Asn Gly
115 120 125

Trp Arg Cys Ala Glu Lys Ser Ala Asp Tyr Val Trp Val Leu Asp Pro
130 135 140

Ile Asp Gly Thr Lys Ser Phe Ile Thr Gly Lys Pro Leu Phe Gly Thr
145 150 155 160

Leu Ile Ala Leu Leu His Asn Gly Lys Pro Val Met Gly Ile Ile Asp
165 170 175

Gln Pro Ile Leu Arg Glu Arg Trp Val Gly Val Asp Gly Lys Lys Thr
180 185 190

Thr Leu Asn Gly Gln Glu Ile Ser Val Arg Pro Cys Asn Val Leu Glu
195 200 205

Gln Ala Tyr Leu Tyr Thr Thr Ser Pro His Leu Phe Glu Gly Asp Ala
210 215 220

Glu Asp Ala Phe Ile Arg Val Arg Asp Lys Val Lys Val Pro Leu Tyr
225 230 235 240

```
Gly Cys Asp Cys Tyr Ala Tyr Ala Leu Leu Ala Ser Gly Phe Val Asp
                245                 250                 255

Leu Val Val Glu Ser Gly Leu Lys Pro Tyr Asp Phe Leu Ser Leu Val
            260                 265                 270

Pro Val Ile Glu Gly Ala Gly Gly Ser Ile Thr Asp Trp Glu Gly Asn
        275                 280                 285

Lys Leu His Trp Pro Val Ser Ser Glu Ser Arg Pro Thr Ser Phe Asn
    290                 295                 300

Val Val Ala Ala Gly Asp Ser His Val His Gly Gln Ala Leu Ala Ala
305                 310                 315                 320

Leu Arg Trp Arg
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<210> 21
<211> 273
<212> PRT
<213> Lycopersicon esculentum

<400> 21

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Met Ala Arg Asn Gly Ser Leu Glu Glu Phe Leu Gly Val Ala Val Asp
  1               5                  10                  15

Ala Ala Lys Arg Ala Gly Glu Ile Ile Arg Lys Gly Phe His Glu Thr
            20                  25                  30

Lys His Val Val His Lys Gly Gln Val Asp Leu Val Thr Glu Thr Asp
        35                  40                  45

Lys Ala Cys Glu Asp Leu Ile Phe Asn His Leu Lys Gln His Phe Pro
    50                  55                  60

Ser His Lys Phe Ile Gly Glu Glu Thr Ser Ala Ala Thr Gly Asp Phe
65                  70                  75                  80

Asp Leu Thr Asp Glu Pro Thr Trp Ile Val Asp Pro Val Asp Gly Thr
                85                  90                  95

Thr Asn Phe Val His Gly Phe Pro Ser Val Cys Val Ser Ile Gly Leu
            100                 105                 110

Thr Ile Gly Lys Ile Pro Thr Val Gly Val Val Tyr Asp Pro Ile Ile
        115                 120                 125

Asp Glu Leu Phe Thr Gly Ile Asn Gly Lys Gly Ala Tyr Leu Asn Gly
    130                 135                 140

Lys Pro Ile Lys Val Ser Ser Gln Ser Glu Leu Val Lys Ser Leu Leu
145                 150                 155                 160

Gly Thr Glu Val Gly Thr Thr Arg Asp Asn Leu Thr Val Glu Thr Thr
                165                 170                 175

Thr Arg Arg Ile Asn Asn Leu Leu Phe Lys Val Arg Ser Leu Arg Met
            180                 185                 190

Cys Gly Ser Cys Ala Leu Asp Leu Cys Trp Val Ala Cys Gly Arg Leu
        195                 200                 205

Glu Leu Phe Tyr Leu Ile Gly Tyr Gly Gly Pro Trp Asp Val Ala Gly
    210                 215                 220
```

```
Gly Ala Val Ile Val Lys Glu Ala Gly Gly Val Leu Phe Asp Pro Ser
225                 230                 235                 240

Gly Ser Glu Phe Asp Ile Thr Ser Gln Arg Val Ala Ala Thr Asn Pro
                245                 250                 255

His Leu Lys Glu Ala Phe Val Glu Ala Leu Gln Leu Ser Glu Tyr Val
            260                 265                 270

Ser
```

<210> 22
<211> 268
<212> PRT
<213> Lycopersicon esculentum

<400> 22

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Met Ala Gln Asn Gly Ser Val Glu Gln Phe Leu Asp Val Ala Val Glu
  1               5                  10                  15

Ala Ala Lys Lys Ala Gly Glu Ile Ile Arg Glu Gly Phe Tyr Lys Thr
            20                  25                  30

Lys His Val Glu His Lys Gly Met Val Asp Leu Val Thr Glu Thr Asp
         35                  40                  45

Lys Ala Cys Glu Asp Phe Ile Phe Asn His Leu Lys Gln Arg Phe Pro
      50                  55                  60

Ser His Lys Phe Ile Gly Glu Glu Thr Thr Ala Ala Cys Gly Asn Phe
 65                  70                  75                  80

Glu Leu Thr Asp Glu Pro Thr Trp Ile Val Asp Pro Leu Asp Gly Thr
                85                  90                  95

Thr Asn Phe Val His Gly Phe Pro Phe Val Cys Val Ser Ile Gly Leu
            100                 105                 110

Thr Ile Glu Lys Lys Pro Thr Val Gly Val Val Tyr Asn Pro Ile Ile
        115                 120                 125

Asp Glu Leu Phe Thr Gly Ile Asp Gly Lys Gly Ala Phe Leu Asn Gly
    130                 135                 140

Lys Pro Ile Lys Val Ser Ser Gln Ser Glu Leu Val Lys Ala Leu Leu
145                 150                 155                 160

Ala Thr Glu Ala Gly Thr Asn Arg Asp Lys Leu Val Val Asp Ala Thr
                165                 170                 175

Thr Gly Arg Ile Asn Ser Leu Leu Phe Lys Val Arg Ser Leu Arg Met
            180                 185                 190

Cys Gly Ser Cys Ala Leu Asn Leu Cys Gly Val Ala Cys Gly Arg Leu
        195                 200                 205

Asp Leu Phe Tyr Glu Leu Glu Phe Gly Gly Pro Trp Asp Val Ala Gly
    210                 215                 220

Gly Ala Val Ile Val Lys Glu Ala Gly Gly Phe Val Phe Asp Pro Ser
225                 230                 235                 240

Gly Ser Glu Phe Asp Leu Thr Ala Arg Arg Val Ala Ala Thr Asn Ala
                245                 250                 255
```

```
His Leu Lys Asp Ala Phe Ile Lys Ala Leu Asn Glu
            260                 265

<210>  23
<211>  287
<212>  PRT
<213>  Synechocystis sp.

<400>  23
Met Thr Ser Ala Gln Lys Pro Val Phe Ser Pro Ser Asp Leu Gln Thr
  1               5                  10                  15

Trp Leu Glu Ile Ala Thr Glu Ala Val Leu Ala Ala Gly Ala Glu Ile
            20                  25                  30

Phe Ser Leu Trp Gly Lys Val Gln Gln Ile Gln Glu Lys Gly Arg Ala
         35                  40                  45

Gly Asp Leu Val Thr Glu Ala Asp Arg Gln Ala Glu Ala Ile Ile Leu
     50                  55                  60

Glu Ile Ile Lys Arg Arg Cys Pro Asp His Ala Ile Leu Ala Glu Glu
 65                  70                  75                  80

Ser Gly Gln Leu Gly Gln Val Asp Asn Pro Phe Cys Trp Ala Ile Asp
                85                  90                  95

Pro Leu Asp Gly Thr Thr Asn Phe Ala His Ser Tyr Pro Val Ser Cys
            100                 105                 110

Val Ser Ile Gly Leu Leu Ile Gln Asp Ile Pro Thr Val Gly Val Val
        115                 120                 125

Tyr Asn Pro Phe Arg Gln Glu Leu Phe Arg Ala Ala Thr Ser Leu Gly
    130                 135                 140

Ala Thr Leu Asn Arg Arg Pro Ile Gln Val Ser Thr Thr Ala Ser Leu
145                 150                 155                 160

Asp Lys Ser Leu Leu Val Thr Gly Phe Ala Tyr Asp Arg Val Lys Thr
                165                 170                 175

Leu Asp Asn Asn Tyr Pro Glu Phe Cys Tyr Leu Thr His Leu Thr Gln
            180                 185                 190

Gly Val Arg Arg Ser Gly Ser Ala Ala Ile Asp Leu Ile Asp Val Ala
        195                 200                 205

Cys Gly Arg Leu Asp Gly Tyr Trp Glu Arg Gly Ile Asn Pro Trp Asp
    210                 215                 220

Met Ala Ala Gly Ile Val Ile Val Arg Glu Ala Gly Gly Ile Val Ser
225                 230                 235                 240

Ala Tyr Asp Cys Ser Pro Leu Asp Leu Ser Thr Gly Arg Ile Leu Ala
                245                 250                 255

Thr Asn Gly Lys Ile His Gln Glu Leu Ser Gln Ala Leu Ala Ala Thr
            260                 265                 270

Pro Gln Trp Phe Gln Gln Tyr Ala Ala Ala Arg Ala Gln Lys Ile
        275                 280                 285

<210>  24
<211>  267
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<212>  PRT
<213>  Synechocystis sp.

<400>  24
Met Leu Pro Glu Val Glu Gln Arg Leu Phe Ile Ala Gln Gln Leu Ala
  1               5                  10                  15

Ala Val Ser Gly Glu Ile Leu Ile Gln Tyr Phe Arg Arg Ser His Leu
             20                  25                  30

Gln Gly Gly Thr Lys Ile Asp Gln Val Ser Ala Ile Val Thr Gln Ala
         35                  40                  45

Asp Glu Glu Ala Glu Gln Ala Met Val Asp Leu Ile Gln Ala Gln Phe
     50                  55                  60

Pro Gln Asp Gly Val Ile Arg Glu Glu Gly Lys Asn Ile Ala Gly Lys
 65                  70                  75                      80

Ser Gly Tyr Thr Trp Val Leu Asp Pro Ile Asp Gly Thr Ser Ser Phe
                 85                  90                  95

Val Arg Gly Leu Pro Ile Phe Ala Thr Leu Ile Gly Leu Val Asp Ala
            100                 105                 110

Asp Met Arg Pro Val Leu Gly Ile Ala His Gln Pro Ile Ser Gly Asp
        115                 120                 125

Arg Trp Gln Gly Val Gln Gly Glu Gln Ser Asn Val Asn Gly Ile Pro
    130                 135                 140

Leu Val Asn Pro Tyr Lys Ala Ser Glu Ile Asn Leu Thr Ala Ala Cys
145                 150                 155                     160

Ile Val Ser Thr Thr Pro Leu Met Phe Thr Thr Pro Val Gln Gln Gln
                165                 170                 175

Lys Met Ala Asp Ile Tyr Arg Gln Cys Gln Arg Thr Ala Phe Gly Gly
            180                 185                 190

Asp Cys Phe Asn Tyr Leu Ser Ala Ala Ser Gly Trp Thr Ala Met Pro
        195                 200                 205

Leu Val Ile Val Glu Ala Asp Leu Asn Phe Tyr Asp Phe Cys Ala Leu
    210                 215                 220

Ile Pro Ile Leu Thr Gly Ala Asn Tyr Cys Phe Thr Asp Trp Gln Gly
225                 230                 235                     240

Lys Glu Leu Thr Pro Glu Ser Thr Glu Val Val Ala Ser Pro Asn Pro
                245                 250                 255

Lys Leu His Ser Glu Ile Leu Ala Phe Leu Gln
            260                 265
```